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OBSERVATIONS ON *FRAXINUS ALBICANS* BUCKLEY (OLEACEAE), THE CORRECT BOTANICAL NAME FOR TEXAS ASH

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ABSTRACT

Fraxinus americana (eastern North America) and the closely similar Texas ash (Texas, southern Oklahoma, and north-central Mexico) have sometimes been considered to be conspecific, but they are treated here as distinct species. A key contrasting the features of each is provided and the county-level distribution of each is mapped; the distribution of *F. americana* is shown only for Texas and Oklahoma to indicate its parapatry with its close relative. **Fraxinus albicans Buckley** (1863) is the correct botanical name for the species previously identified as *F. texensis* (A. Gray) Sargent (1894). Lectotypes are designated for *F. albicans* and for *F. americana* var. *texensis* A. Gray (= *F. texensis*). Photos of the types are provided.
KEY WORDS: *Fraxinus albicans*, *F. texensis*, *F. americana*, Oleaceae

Fraxinus texensis (A. Gray) Sargent (Texas ash) was mapped by Turner et al. (2003) as a variety of *F. americana* L. (white ash), as originally described by Asa Gray. It was treated as a subspecies of *F. americana* by Miller (1955) but Correll and Johnston (1970), Simpson (1988), and Diggs et al. (1999) treated it at specific rank. Texas ash shares the distinctive abaxial leaf surface found in white ash (Hardin & Beckmann 1982; Williams & Nesom 2009) and also is similar in samara morphology, but Texas ash usually occurs in more xeric habitats along the western margin of white ash (Fig. 1) and is morphologically distinct.

Miller (1955, p. 24) noted that at the southwestern extension of its range, typical *Fraxinus americana* "gives way" to Texas ash (identified by her as *F. americana* subsp. *texensis*) and that "since [Texas ash] is physiologically and ecologically separated from the white ash, and morphologically distinguishable, it is worthy of recognition beyond a mere variant of the white ash." She treated it at subspecific rank because "it apparently does hybridize on occasion with the white ash," listing four collections that she regarded as examples of such hybrids. Each of these four, however, was collected outside of the known range of Texas ash and none is likely to be such a hybrid. Schlesinger (1990) also noted, without documentation, perhaps based on the previous observations by Miller, that white ash and Texas ash intergrade.

The present study corroborates previous observations that Texas ash and white ash are closely similar but discontinous in ecology and morphology. Populational variants within white ash sometimes approach Texas ash in features of fruit or leaf morphology, but it seems clear that two evolutionary entities exist. The two taxa are essentially allopatric or parapatric, with their ranges most closely in contact in south-central Oklahoma. White ash occurs in mesic valleys and bottoms in that area, and true genetic intergrades might be most successfully sought there.

Differences between Texas ash and white ash, as the latter occurs in Texas and Oklahoma, are summarized in the following contrast.

1. Leaf scars 2.5–3(–4) mm wide, depressed obovate, the upper margin shallowly concave to slightly notched with slightly flaring margins; rachises (1–)2–6(–7) cm; leaflet blades 3–6(–8) cm x 2–5 cm, usually suborbicular-ovate to obovate, oblong-ovate, or elliptic, apex abruptly acute to rounded; samaras (12–)15–26(–35) mm long, wings 3–5(–6) mm wide, bodies 5–8 mm long, 1.5–2(–3) mm wide. ..... **Texas ash**
1. Leaf scars 3–4 mm wide, U- or crescent-shaped with a deeply concave or deeply notched apex and narrowly flaring margins; rachises 5–10 cm; leaflet blades 5.5–12(–15) cm x (2–)2.5–6(–7.5) cm, ovate to ovate-lanceolate, elliptic-lanceolate, or oblong-elliptic, apex acute to acute-acuminate or less commonly obtuse; samaras (19–)25–32(–38) mm long, wings 3–5(–6) mm wide, bodies (5–)6–11 mm long, 1.5–2.5 mm wide. ..... **white ash**

Variation in samara morphology in an array from each taxon is shown in Fig. 2a and b. Fruits of white ash are from putatively diploid individuals from Texas, Oklahoma, and Louisiana. A small-fruited form of white ash occurs in scattered localities as variants in diploid populations (Fig. 6), especially in southern states of the USA, and samaras at the small end of the size range for the white ash are much less common than samaras of typical size. Gray (1886, p. 75) commented that some small fruits of *Fraxinus americana* var. *microcarpa* A. Gray (the type from Alabama) were "seemingly full grown but seedless" — all small-fruited collections that I have seen, however, have produced fruits with bodies fully filled by embryos.

Three levels of ploidy occur within *Fraxinus americana*—diploids, tetraploids, and hexaploids — but only diploids reach westward and closely approach the range of Texas ash (Nesom in prep.). A chromosome number has not been reported for Texas ash.

The geographic range of Texas ash is mostly along the eastern portion of the Edwards Plateau in Texas, northward into the Arbuckle Mountains region of south-central Oklahoma, and southward into northern Coahuila and Nuevo León (Fig. 2). It occurs mostly on rocky slopes and bluffs or stream and in canyons and ravines, commonly with cedar elm, juniper, juniper-oak, post oak-blackjack oak, pine-hardwood, or oak-maple. Particularly large individuals of Texas ash are within Fort Worth, Texas, in areas of the Trinity River floodplain that were intermittently flooded until the last 50 years—some of these trees reach nearly 70 feet in height and 100 inches (diameter breast high) in circumference. Typical individuals occur abundantly in nearby upland areas. White ash is widespread in the eastern North America and characteristically occurs in mesic hardwoods communities, on slopes and flats.

Plants in the Davis Mountains of trans-Pecos Texas (Jeff Davis Co.) identified by Palmer (1929, p. 42) as *Fraxinus texensis*, "the commonest species of ash in the Davis Mountains," instead are *F. velutina* Torrey (e.g., *Palmer 30822*, MO; *Palmer 30797*, GH, MO; *Palmer 34343*, GH; *Palmer 34344*, GH). Palmer also identified *F. velutina* as occurring in the Davis Mountains but did not specify his concept of the distinction between the two putative species.

Vouchers for records of Texas ash in Mexico (as mapped in Fig. 1) are given here: **Coahuila**. W side of Potrero de la Mula, ca 20 km NW of Ocampo, on the escarpment near the mines, tree 10 feet tall with oaks on N-facing middle slope, 18 Sep 1941, *I.M Johnston 9222* (GH) and tree 12 ft tall, frequent on N slopes along crest, 18 Sep 1941, *I.M Johnston 9254* (GH); Sierra de Gloria, SE of Monclova, Jul 1939, *Marsh 1870* (GH). **Nuevo León**. Mpio. Villaldama, Rancho Minas Viejas, camino hacia Las Pilas, bosque de *Quercus*, 1170 m, 16 Apr 2001, *Estrada 12399* (BRIT-2 sheets).

The correct botanical name for the Texas ash.

The names *Fraxinus americana* var. *texensis* A. Gray (= *F. texensis*) and *F. albicans* Buckley have been closely associated in concept, as explained below, and their relationship to typical *F. americana* also has been at issue. If the nomenclatural types of *F. americana* var. *texensis* and *F. albicans* are conspecific with each other and not conspecific with the type of *F. americana*, then *F. albicans* of 1863 is the correct name at specific rank for Texas ash, replacing Sargent's *F. texensis* (A. Gray) Sargent of 1894.

Without clear typification, the application of *Fraxinus albicans* has been ambiguous. A possible course toward clarification is to lectotypify it with a specimen of typical *F. americana*, thus allowing retention of the long-used and geographically appropriate *F. texensis* for the primarily Texas trees. The most justifiable interpretation of protologues and specimens, however, as detailed below, indicates that *F. albicans* is the correct botanical name for the Texas ash and should be adopted.

Potential type material for *Fraxinus albicans* at PH includes sheets with a mixture of the Texas ash, white ash with typical-sized fruits, and green ash (*F. pennsylvanica* Marsh.). The mixtures of species were assessed and annotated in 1996 by Achinelli-Delucchi, working out of the Museo de la Plata (LP).

PH-1070637 (Fig. 3): **Texas ash**, 1 fruiting branch, 2 detached leaves; **white ash**, portion of infructescence, 1 detached leaf. Handwritten label by an unknown hand and above it a shorter one written by Buckley; on both labels, the handwritten epithet "~~neglecta~~" (by Buckley, with the strikethrough) was replaced immediately above it (also by Buckley) by "albicans." Buckley's handwriting is established by comparison with samples in Dorr and Nixon (1985).

The label in unknown hand, probably referring to the detached leaf and infructescence (*F. americana* sensu stricto) immediately above it, has this: "No. 40. White ash. Fraxinus __ [Buckley's handwritten names] I am not certain that this is all of the family in our portion of Texas. It is one of our largest and useful timber trees; our wagons, buggies, plough stock, axe handles and and cotton baskets are composed of it. It makes our best flooring plank. To 100 ft. Blooms last of March."

PH-1070637 was collected in Texas, and the small leaflets, characteristic petiole bases (leaf scars), and small fruits clearly serve to identify this collection as Texas ash. Selected here as lectotype.

PH-1070638: **white ash**, 1 fruiting branch, 1 detached leaf, one detached node with 2 leaves. Handwritten label by Durand(?) noting "*Fraxinus albicans* Buckl.! & no mistake!!!"; the bottom of this label has Asa Gray's annotation of *F. americana* L.!"

This plant has large fruits, relatively large ellliptic to elliptic-ovate leaflets, and petiole bases identifying it as typical white ash. Provenance not indicated.

PH-1070639: **Texas ash**, 1 fruiting branch, on the right; *F. berlandieriana* DC., 1 fruiting branch. Small handwritten label on blue paper by Buckley as "*Fraxinus albicans* Buckl., Texas," although the label is not unambiguously associated with one or the other of the branches.

The branch of Texas ash on PH-1070639 could easily be from the same tree as the designated lectotype (PH-1070637) and is taken here to be an isolectotype.

GH (Fig. 4): **Texas ash**, 2 detached leaves, 15 fruits. Written on the sheet by Asa Gray: "'F. albicans,' Buckley, the real, or one of them, i.e., reduced F. Americana. Texas. Buckley! ex spec. Durand. = F. Americana,? var. Texensis." Annotated by Miller in 1950 as "*F. texensis* Sarg."

The GH material probably was taken by Gray from the specimen designated here as lectotype of *F. albicans* (PH-1070637, loaned to Gray in 1862 and annotated by him as "Texas. Buckley! ex spec. Durand"), which has a large number of fruits, some attached to the infructescence and some loose. Taken here to be an isolectotype.

Asa Gray's involvement with the Texas ash began almost immediately after Buckley's publication. He borrowed material from PH and quickly published a commentary (Gray 1862).

> "Having for many years past taken a prominent part in the study of Texan botany, as made known by the ample collections of Berlandier, Drummond, Wright, Lindheimer, Thurber, and others, and being under the necessity of keeping, as nearly as possible, *au courant* with all publications upon the subject, I was naturally much interested in the appearance of Mr. Buckley's two papers, and not a little surprised at the large number of new species which he had gleaned in such a well-harvested field. Accordingly I applied for specimens of the plants in question; and Mr. Buckley — an early correspondent of Dr. Torrey and myself — promptly and obligingly has placed in my hands, for examination, nearly the whole original materials upon which these new genera and species were characterized." [p. 161]
>
> "Turning to Mr. Buckley's Texan specimens [of *Fraxinus*] in the herbarium of the Academy, I find there are two, both in fruit; one with the larger larves and fruit is clearly *F. viridis*, var. *Berlandieriana*, Torr., Bot. Mex. Bound. (*F. Berlandieriana* DC.); the other is, I think a form of *F. Americana* (i.e., *albicans* of Buckley), of the small-fruited form we are familiar with, but with very small leaves as well as fruits, the latter terete and cylindrical in the manner of the species." [p. 166]

Thus it appears that Gray studied at least PH-1070639. The material for the GH isolectotype of *Fraxinus albicans* either was sent to GH as a gift, or it could have been taken from PH-1070637, which has a large number of fruits, some attached to the infructescence and some loose. In any case, Gray's assessment at the time was that the Texas ash should be identified as *F. americana* and he roundly castigated Buckley, noting that he "had no need to give a new specific name to the white ash." Later, Gray (1886) did recognize the Texas ash as a distinct entity.

Fraxinus albicans Buckley, Proc. Acad. Nat. Sci. Philadelphia 14: 4. 1862. *Fraxinus americana* var. *albicans* (Buckley) Lingelsh., Mitt. Deutsch. Dendrol. Ges. 1911: 184. 1911. **LECTOTYPE** (designated here; Fig. 3): **USA**. Texas. No other information, *S.B. Buckley s.n.* (PH-1070637 digital image!; isolectotypes: GH! "ex spec. Durand" (Fig. 4), PH-1070639 digital image!). See detailed notes below regarding the lectotype, isolectotypes, and other type material. Miller (1955, p. 36) noted that the type of *F. albicans* ["in part"] was at PH but did not cite or allude to any particular specimen or collector.

Protologue (excl. description): "It is found from New England to Texas, being the largest of the American ash trees, sometimes attaining a diameter of between four and five feet. Its bark is furrowed and of a light grey; hence it is called the white ash in many places. Its petioles are grooved, and its buds are destitute of the red velvety pubescence peculiar to *F. americana*. I have not seen it in the vicinity of Phildelphia, nor is there any specimen of it collected in this neighborhood in the herbarium of the Academy. In the herbarium of Darlington, at West Chester, I saw specimens of it labelled *F. americana*, and it is probably thus called by other American botanists. The West Chester collection had no specimens of *F. americana* or *F. pubescens*. [paragraph] Both *F. americana* and *F. albicans* being called white ash throughout the counry have caused them to be confounded, especially where, as is often the case, they do not both grow in the same locality; but the fruit of the latter is only about half the size of the former, which, with the other distinctions enumerated, show that they are very different species."

Fraxinus americana var. *texensis* A. Gray, Syn. Fl. N. Amer. (ed. 2) 2(1): 75. 1886. *Fraxinus texensis* (A. Gray) Sargent, Silva 6: 47. 1894 [nom. superfl. illeg., in the interpretation here that it is conspecific with *Fraxinus albicans* Buckley 1862]. *Fraxinus americana* subsp. *texensis* (A. Gray) G.N. Miller, Cornell Expt. Station 335: 36. 1955. **LECTOTYPE** (designated here; Fig. 5): **USA**. Texas. [Val Verde Co.:] Cañon of Devil's River, 16 Sep 1852, *J.M. Bigelow s.n.* (GH!; isolectotype: NY digital image!). The GH sheet is annotated in Gray's handwriting, on a "Syn. Fl. N. Amer." annotation label, as "F. americana var?. texensis."

Protologue (excl. description): "*F. albicans*, Buckley, l. c., in part. *F. pistaciaefolia*, E. Hall, List. Pl Tex. no. 527. *F. coriacea*, Watson, l. c., as to pl. Bigelow, "Devil's Run Cañon," Texas (not "Arizona"). … Texas, on rocky hills, from Austin to Devil's River, near the Rio Grande. Perhaps a distinct species." A syntype is from Travis Co.: Austin, rocky hill, 13 May 1872, *E. Hall 527* (GH!, NY digital image!).

An internal contradiction in Buckley's protologue for *Fraxinus albicans* causes a difficulty in interpretation. Buckley noted that *F. albicans* is a large tree ranging widely in eastern North America—this does not characterize the Texas ash, in which the trees are mostly relatively smaller in size and geographically restricted. In contrast, he observed that the fruits of *F. albicans* are about half the size of those of *F. americana* — this is truer of the Texas ash, although atypically small fruits also are produced in scattered localities in typical *F. americana* over its wider range (see comment below). From the protologue observations, it appears that Buckley's concept of *F. albicans* included the Texas ash and the small-fruited forms of typical *F. americana*. In Buckley's type material of *F. albicans*, however, the small-fruited form is represented only by trees of the Texas ash. Typical *F. americana* is represented (on two of the Buckley sheets at PH) by trees with larger fruits.

In the original description of *Fraxinus americana* var. *texensis*, Gray (1886, p. 75) cited "*F. albicans*, Buckley, l.c., in part" as a synonym. Immediately above, on the same page, he cited "*F. albicans*, Buckley in Proc. Acad. Philad. 1862, partly" under *F. americana* var. *microcarpa* A. Gray. Gray's partition of the concept of *F. albicans* appears to reflect his understanding that the taxon in the sense of Buckley's protologue and type material included an entity from Texas as well as from the eastern USA. Gray's comments of 1886 did not refer to a specimen, but he had seen at least one of the associated Buckley collections from PH (see comments above regarding the GH isolectotype of *F. albicans*) and acquired for GH a sample of fruits and leaves representing the Texas ash. Gray clearly associated Buckley's type material with the Texas ash, the Texas "part" of the *F. albicans* concept. The other "part," var. *microcarpa*, will be lectotypified by a Curtiss collection from Alabama (Nesom in prep.), which represents a small-fruited populational variant of typical *F. americana* (see example in Fig. 6).

When Sargent (1894) raised *Fraxinus americana* var. *texensis* to specific rank, he cited in synonymy "Fraxinus albicans, Buckley, Proc. Phil. Acad. 1862, 4 (in part)," repeating Gray's partitioned concept. Because the correspondence was clear between var. *texensis* and its associated "part" of *F. albicans*, Sargent's use of *F. texensis* at specific rank is interpreted here as a superfluous substitution for the earlier *F. albicans*, rendering his combination illegitimate. Lingelsheim (1907, 1920) and Miller (1955) also have considered *F. albicans* conspecific with *F. americana*. Miller repeated the "*F. albicans* Buckley in part" phrasing in listing it as a synonym, but Lingelsheim (1920) recognized *F. americana* var. *albicans* and unequivocally cited *F. albicans* Buckley and *F. americana* var. *texensis* A. Gray as synonyms.

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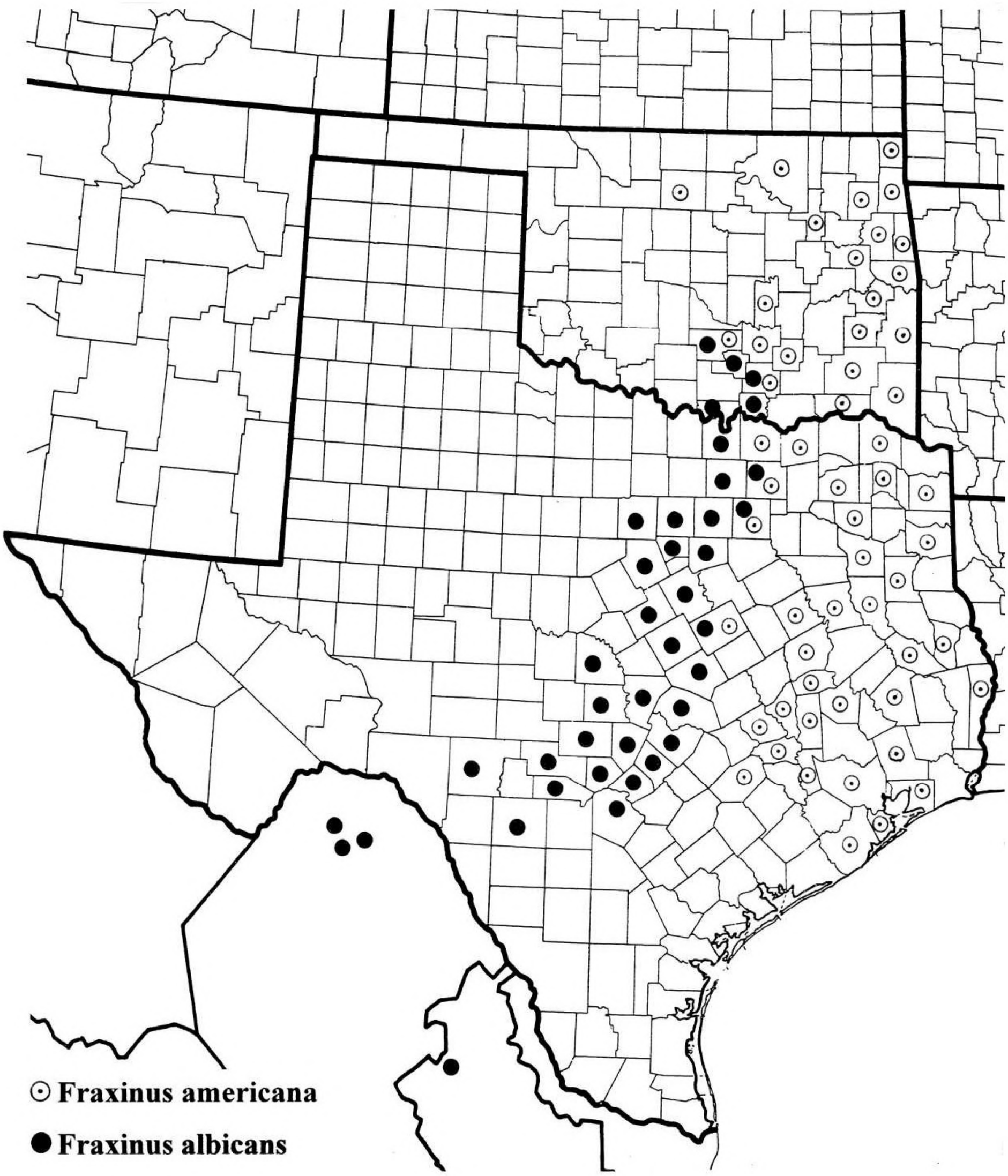
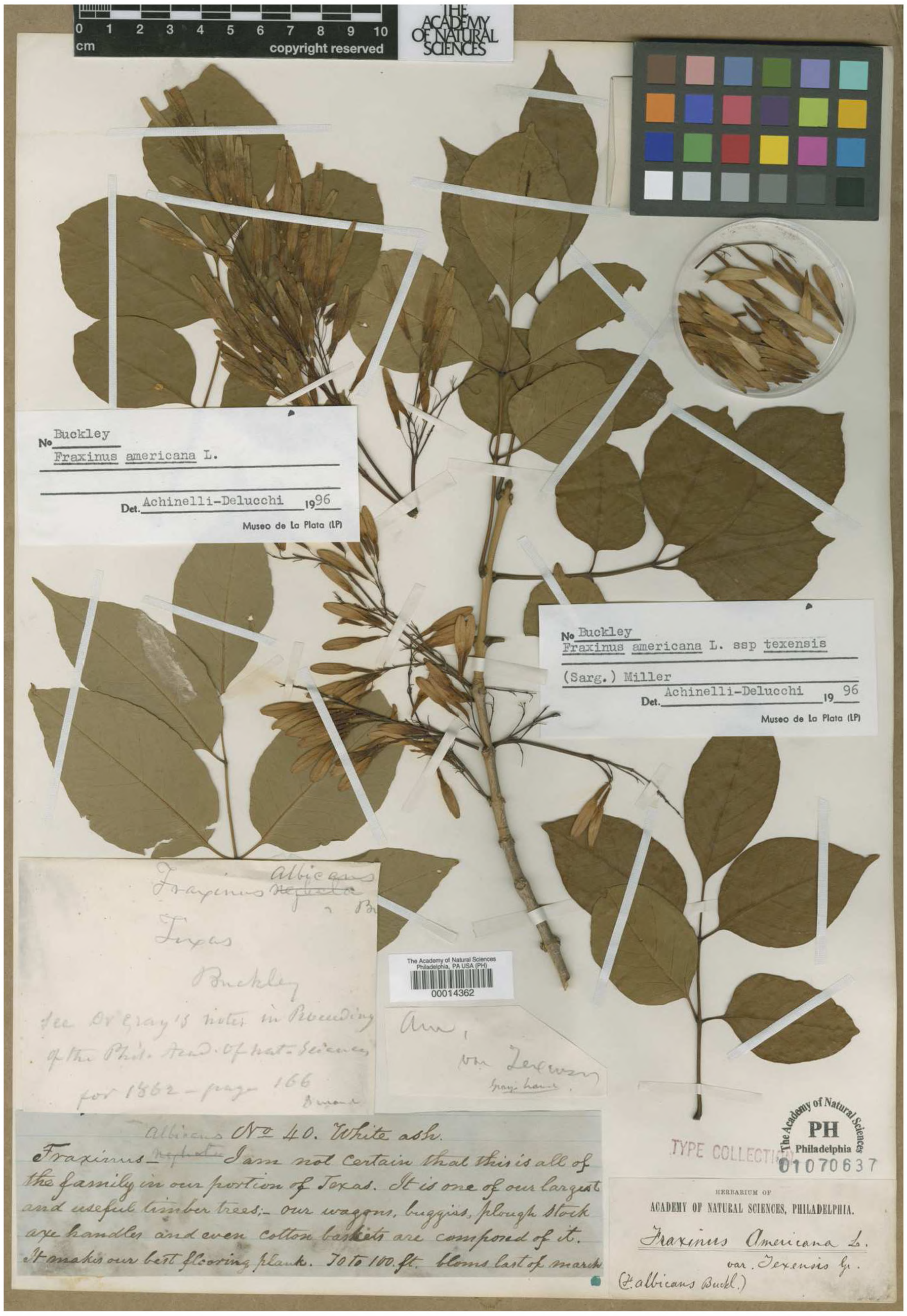


Figure 1. Distribution of the Texas ash, *Fraxinus albicans* (see text regarding the epithet). The distribution of *F. americana* is shown for Texas and Oklahoma to indicate its parapatry with *F. albicans*.

Figure 2. Samara variation. Top two rows, Texas ash (*Fraxinus albicans*) in Texas and Oklahoma. Bottom two rows, typical diploid white ash (*Fraxinus americana*) in Texas, Oklahoma, and Louisiana.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THE ACADEMY OF NATURAL SCIENCES
No Buckley
Fraxinus americana L.
Det. Achinelli-Delucchi 1996
Museo de La Plata (LP)
No Buckley
Fraxinus americana L. ssp texensis
(Sarg.) Miller
Det. Achinelli-Delucchi 19 96
Museo de La Plata (LP)
Fraxinus albicans
Texas
Buckley
See Dr Gray's notes in Proceeding of the Phil. Acad. of Nat. Sciences for 1862 – page 166
albicans No 40. White ash.
Fraxinus I am not certain that this is all of the family in our portion of Texas. It is one of our largest and useful timber trees;– our waggons, buggies, plough Stock axe handles and even cotton baskets are composed of it. It makes our best flooring plank. 70 to 100 ft. bloms last of march
The Academy of Natural Sciences Philadelphia, PA USA (PH)
00014362
TYPE COLLECTION
The Academy of Natural Sciences PH Philadelphia 01070637
HERBARIUM OF
ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.
Fraxinus Americana L.
var. Texensis Gr.
(F. albicans Buckl.)

Figure 3. Lectotype of *Fraxinus albicans* (PH). Detatched leaves at bottom right and top left, fruiting branch, loose fruits. See comments in text.

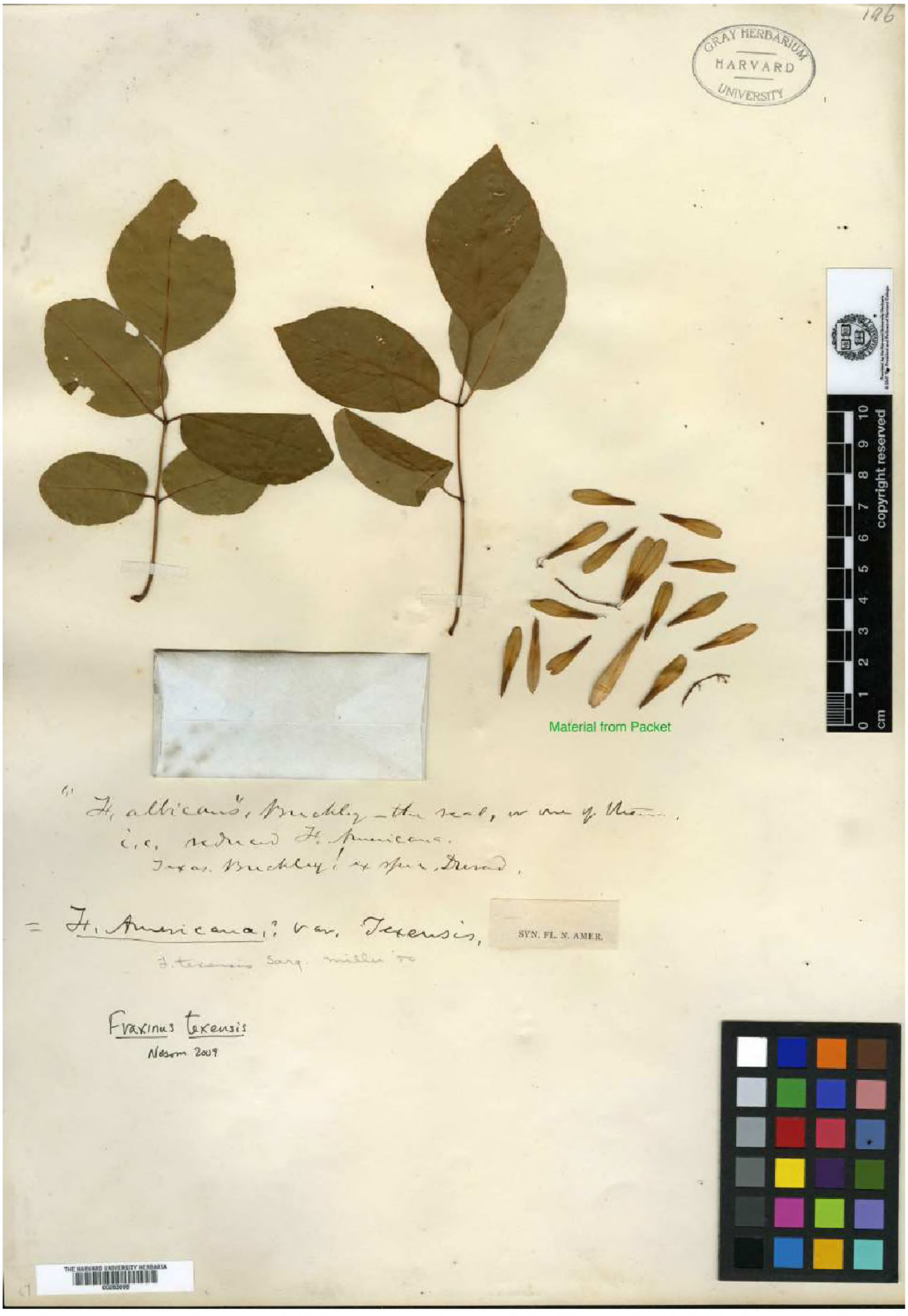

Figure 4. Isolectotype of *Fraxinus albicans* (GH). See comments in text.

GRAY HERBARIUM
HARVARD
UNIVERSITY
Material from Packet
Fraxinus texensis !
Nesom 2009
F. Americana ?
Var. Texensis.
SYN. FL. N. AMER.
MEXICAN BOUNDARY SURVEY.
Collected under the direction of Major W. H. Emory, Commissioner, chiefly in the Valley of the Rio Grande, below Doñana—by C. C. Parry, M. D., J. M. Bigelow, M. D., Mr. Charles Wright, and Mr. A. Schott.
F. coriacea, S.D.
"Texas, 1st Jan.
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Figure 5. Lectotype of *Fraxinus americana* var. *texensis* (GH). See comments in text.

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THE NEW YORK BOTANICAL GARDEN
The New York Botanical Garden
Fraxinus americana L. (diploid)
Nesom 2010
Herbarium of the University of Alabama
PLANTS OF ALABAMA
273
US
Fraxinus americana L.
Abundant tree along the banks of Cataco Creek 0.3 mi S of the Tennesse River. T.5.S. R.2.W. Sec 33
NEW YORK BOTANICAL GARDEN
NEW YORK BOTANICAL GARDEN
01163859
County: MORGAN
Date: 4 JULY 1980
Russell A. Meigs # 935

Figure 6. *Fraxinus americana* with atypically small samaras (from Morgan Co., Tennessee). Such individuals sometimes have been identified as *F. americana* var. *microcarpa* (see text).